

RECEIVED

September 18, 2009

Wastewater Discharge Programision of Water Quality Wastewater Discharge Program

Alaska Dept. of Environmental Conservation ATTN: Watershed Management Section 555 Cordova Street Anchorage, Alaska 99501

FedEx Tracking Number: 7969 5804 3579

DISCHARGE MONITORING REPORTS, NPDES PERMIT NUMBERS SUBJECT:

AKG-31-5003 EAST FORELANDS FACILITY

AKG-31-5012 PLATFORM A AKG-31-5013 PLATFORM C

Enclosed are the subject National Pollution Discharge Elimination System (NPDES) Discharge Monitoring Reports for the month of August 2009.

If there are any questions, please don't hesitate to contact me at (907) 776-2510 or Scott Griffith at (907) 776-2506.

Yours Truly,

Ryan Tunseth

Environmental, Health & Safety Coordinator

Enclosures:

August 2009 DMR 2nd Period WET Test Report

cc: Director, Office of Water &Watersheds U.S. Environmental Protection Agency Region 10 1200 Sixth Avenue, OWW-130 Seattle, Washington 98101

> Director, Office of Compliance and Enforcement U.S. Environmental Protection Agency, Region 10 1200 Sixth Avenue, OCE-133 Seattle, Washington 98101

Scott Griffith Mike Oconnor

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) DISCHARGE MONITORING REPORT (DMR)

NAME: XTO ENERGY, INC

ADDRESS: 52260 WIK RD

KENAI, AK 99611

FACILITY: EAST FORELANDS

LOCATION: 60° 31' 10" N; 151° 20' 31" W

(2-16)	(17-19)
AKG 31 5003	015
PERMIT NUMBER	DISHCARGE NUMBER

CHECK HERE IF NO DISCHARGE

MONITORING PERIOD

FROM	YEAR	MONTH	DAY
	2009	8	1
	(20-21)	(22-23)	(24-25)

то	YEAR	MONTH	DAY		
10	2009	8	31		
	(26-27)	(28-29)	(30-31)		

PARAMETER			QUANTITY 53) (54-61)	OR LOADIN	IG (46-	QUALI (38-45)	TY OR CON (46-53)	CENTRATIO	N	NO EX.	FREQUENCY	SAMPLE TYPE (69-70)
(32-37) D15 - Produced Water	gen 2 spale 2		Average	Maximum	Units	Minimum	Average	Maximum	Units	(62-63)	OF ANALYSIS	
TO THOUSE TRAINE	FLOW	Sample Measurement	0.097656774	0.150528	MOD	***	***	***		0	(64-68) Weekly	Estimate
D15 - Produced Water		Permit Requirement	**		MGD	•••	•••		***	•••	Weekly	Estimate
PRODUCED SAND		Sample Measurement	***	***	***	No discharge	No discharge	No discharge		0	***	***
015 - Produced Water		Permit Requirement		•••		No discharge	No	No discharge	***	•••		4.
DIL & GREASE		Sample Measurement Permit	***	***	***	***	9.9	12		0	Weekly	Grab
015 - Produced Water		Requirement Sample	*			•••	29	42	mg/l	•••	Weekly	Grab
ρΗ		Measurement Permit	***	***	***	7.06	***	7.4	SU	0	Weekly	Grab
)15 - Produced Water		Requirement		•••		6	6 9	30	•••	Weekly	Grab	
TAH	Sample *** *** Measurement	***	***	19.18	19.18	0	0	Monthly	Grab			
115 - Produced Water		Permit Requirement	•		***		24	32	mg/l	***	Monthly	Grab
AgH		Sample Measurement	***	***	***	***	19.48	19.48		0	Monthly	Grab
15 - Produced Water		Permit Requirement	7			•••	Report	Report	mg/l	•••	Monthly	Grab
OTAL AMMONIA		Sample Measurement	分妆妆	***	***	5.1	5.1	5.1	0	0	Quarterly	Grab
IAME TITLE PRINCIPAL		Permit Requirement		•••		Report		Report	mg/l	•••	Quarterly	Grab
XECUTIVE OFFICER				11.00		ezessairā)	terrandes			ecologija nestija		
Ryan Tunseth	I certify under penalty of supervision in accordance evaluate the information										phone	Date (YR/MO/DAY)
HSE&T Coordinator				rson or persons the information ware that there	who manag submitted i are significa	e the system, s, to the best int penalties	174	Signature			76-2510	9/18/2009

COMMENTS & EXPLANATION OF ANY VIOLATIONS: WET Testing sampling frequency is reduced to once/6 months [Section II.G.6.a - Permit # AKG-31-5000] 2nd Period 2009 WET tests were taken on 31-5000] 3rd Quarter 2009 sample results are shown.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) DISCHARGE MONITORING REPORT (DMR)

NAME: XTO ENERGY, INC

ADDRESS: 52260 WIK RD

KENAI, AK 99611

FACILITY: EAST FORELANDS

LOCATION: 60° 31' 10" N; 151° 20' 31" W

(2-16)	(17-19)
AKG 31 5003	015
PERMIT NUMBER	DISHCARGE NUMBER

CHECK HERE IF NO DISCHARGE

MONITORING PERIOD

FROM	YEAR	MONTH	DAY		
TAOM	2009	- 8	1		
	(20-21)	(22-23)	(24-25)		

то	YEAR	MONTH	DAY
10	2009	8	31
	(26-27)	(28-29)	(30-31)

PARAMETER			53) (54-61	-	IG (46-	QUALIT	Y OR CON	CENTRATIO	N	NO EX.	FREQUENCY	SAMPLE TYPE (69-70)
(32-37) 015 - Produced Water			Average	Maximum	Units	Minimum	Average	Maximum	Units	(60.60)	OF ANALYSIS	
COPPER		Sample Measurement	***	***	***	***	3.82	3.82		(62-63) 0	(64-68) Quarterly	Grab
		Permit Requirement	***		***	-	60	90	ug/l	•••	Quarterly	Grab
015 - Produced Water MERCURY		Sample Measurement	***	***		***	N/D	N/D	/	0	Quarterly	Grab
		Permit Requirement			***	•••	0.5	0.8	ug/l	•••	Quarterly	TO THE REPORT OF THE PARTY OF T
015 - Produced Water MANGANESE	and the second s	Sample Measurement	***	***		***	1.04	1.04		0	Quarterly	Grab Grab
		Permit Requirement			***	***	7.9	15.8	mg/l		Quarterly	
SILVER	15 - Produced Water SILVER	Sample Measurement	***	***		***	1.87	1.87		0	Quarterly	Grab
	Permit Requirement			***	***	46	149	ug/l		Quarterly	Grab	
015 - Produced Water ZINC		Sample Measurement	***	***		***	0.342	0.342	mg/l	0	Quarterly	Grab
		Permit Requirement		•••	***	***	3.1	6.1		•••	English Services Mark	Grab
015 - Produced Water NET - <i>Mytilus galloprovincia</i>	alis (invertibrate)	Sample Measurement	***	***		***	< 625	< 625	TUc	0	Quarterly	Grab
		Permit Requirement	•••		***	•••	1209	2425		•••	Semi Annual	Grab
NAME TITLE PRINCIPAL EXECUTIVE OFFICER							1200	2423			Semi Annual	Grab
Ryan Tunseth		of law that this docume nce with a system des								Tel	ephone	Date (YR/MO/DAY)
HSE&T Coordinator	or those persons dried of my knowledge and t	tly responsible for nath	n my inquiry of the p nering the information	person or persons	who manag n submitted i	e the system, s, to the best	Ry	DF		907 7	776-2510	9/18/2009

COMMENTS & EXPLANATION OF ANY VIOLATIONS: WET Testing sampling frequency is reduced to once/6 months [Section II.G.6.a - Permit # AKG-31-5000] 2nd Period 2009 WET tests were taken on 31-5000] 3rd Quarter 2009 sample results are shown.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) DISCHARGE MONITORING REPORT (DMR)

XTO ENERGY, INC ADDRESS: 52260 WIK RD KENAI, AK 99611 FACILITY: EAST FORELANDS

LOCATION: 60° 31' 10" N; 151° 20' 31" W

NAME:

(2-16)	(17-19)
AKG 31 5003	015
PERMIT NUMBER	DISHCARGE NUMBER

CHECK HERE IF NO DISCHARGE

MONITORING PERIOD

FROM	YEAR	MONTH	DAY
FRON	2009	8	1
	/20.241	/22.221	/27/261

TO	YEAR	MONTH	DAY
то	2009	8	31
	(26-27)	(28-29)	(30-31)

PARAMETER			OR LOADIN	IG (46-			CENTRATIO	N	NO EX.	FREQUENCY	SAMPLE TYPE (69-70)
	53) (54-61, Average	Maximum	Units	(38-45) Minimum	(46-53) Average	(54-61) Maximum	Units	-	OF ANALYSIS		
(32-37) 015 - Produced Water		Average	WIGAIIIGIII	Offits	iviii iii iiiiiiiiiiiiiiiiiiiiiiiiiiiii	Average	iviaximum	Units	(62-63)	(64-68)	
VET -	Sample	***	***		***	***	***		0	Semi Annual	Grab
V Know E	Measurement Permit			***				TUc		Ocinii 7 miliaar	Grab
	Requirement	•••			***	1209	2425	1	***	Semi Annual	Grab
015 - Produced Water	Sample					HEAVEL CONTRACTOR					
	Measurement										
	Permit				70					BYTHESEMPSHARE	A STORY OF THE PROPERTY OF THE
	Requirement										
015 - Produced Water	Sample										
	Measurement				x						
	Permit						A THE STATE OF THE			Carried Baraco	Ald State Alexander of the National American State of the
	Requirement			8							
)15 - Produced Water	Sample										
	Measurement			0	0						
	Permit				315.000 300						
015 - Produced Water	Requirement	and the second second	a sauvotes etc.				A LUCIO				
710 - Floduced vvalet	Sample Measurement										
	Permit	3 100 100 100 XXX 0 11 11 11 XX	en destallation	y .	The second second						
	Requirement										
015 - Produced Water	Sample			7		With the second			COMPANY.		
	Measurement										
	Permit		H. H. W. (1985)		E LA COMPANION	SERVICE CONTRACTOR	a North Control		All reports would		
	Requirement				See ALINE						
015 - Produced Water	Sample			l	Control of the Contro	A MANUEL MARKET	ALEXANDOR STORES		A Wallaco		
	Measurement										
	Permit						A STATE OF THE STATE OF		ASSESSED FOR THE PARTY OF THE P	TO I SAMADOS PANTALIS	
	Requirement					Burn hotel					
NAME TITLE PRINCIPAL											
EXECUTIVE OFFICER	continue under appoint of insultant this design								Те	lephone	Date (YR/MO/DAY)
Ryan Tunseth HSE&T Coordinator	I certify under penalty of law that this docum supervision in accordance with a system des evaluate the information submitted. Based o or those persons driectly responsible for gat of my knowledge and belief is true, accurate	signed to assure the n my inquiry of the hering the informat , and complete. I a	at qualified person person or person ion, the informat maware that the	onnel properl ns who mana ion submitted are are signifi	y gather and age the system, dis, to the best cant penalties	RA	the			776-2510	9/18/2009
COMMENTS & EVDI ANAT	of my knowledge and belief is true, accurate, for submitting false information, including the		m aware that the and imprisonme	re are signifi	cant penalties	TS"	Signature		1		

COMMENTS & EXPLANATION OF ANY VIOLATIONS: WET Testing sampling frequency is reduced to once/6 months [Section II.G.6.a - Permit # AKG-31-5000] 2nd Period 2009 WET tests were taken on 07/21/09 and are submitted with this DMR. Additionally the sampling frequency for Copper, Manganese, Silver, Total Mercury, and Zinc is reduced from monthly to quarterly [Section II.G.6.a - Permit # AKG-31-5000] 3rd Quarter 2009 sample results are shown.

TEST IDENTIFICATION

Test No.: 663-61

<u>Title</u>: Mussel (*Mytilus galloprovincialis*) larval test using static 48-hr exposure to XTO Energy – East Foreland. <u>Protocol No.</u>: NAS-XXX-CG/MG2, August 28, 1990, Revision 3 (9-8-01). This protocol complies with the U.S. EPA West Coast chronic toxicity manual (EPA/600/R-95/136) and ASTM bivalve toxicity method (E 724-89).

STUDY MANAGEMENT

Study Sponsor: XTO Energy, 52260 Wik Rd, Kenai, AK 99611

Sponsor's Study Monitor: Mr. Ryan Tunseth

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365.

<u>Test Location</u>: Newport laboratory.

Laboratory's Study Personnel: G.A. Buhler, B.S., Proj. Man.; G.J. Irissarri, B.S., Study Dir.; L.K. Nemeth, B.A., M.B.A., QA Officer; M.S. Redmond, M.S., Aq. Toxicol.; S.J. Gage, B.A., Sr. Tech.

Study Schedule:

Test Beginning: 7-22-09, 1445 hrs.

Test Ending: 7-24-09, 1450 hrs.

<u>Disposition of Study Records</u>: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Description: XTO Energy East Foreland. Details are as follows:

NAS Sample No.	2797G
Collection Date	7-21-09
Receipt Date	7-22-09
Temperature (°C)	4.4
pH	7.9
Dissolved oxygen (mg/L)	- 0.9
Salinity (‰)	22.5

Treatments: Sample was briefly temperature-equilibrated prior to use.

Storage: Used date of receipt.

DILUTION WATER

Source: Yaquina Bay, Oregon. Date of Collection: 7-21-09

Water Quality: Salinity, 30.0 %; pH, 8.1

Pretreatment: Filtered to 0.4 µm, aerated, salinity adjusted with Milli-Q water.

BRINE USED FOR SALINITY CONTROL

Species: Mussel (Mytilus galloprovincialis).

Age: 2.0 hours post-fertilization.

Source: Carlsbad Aquafarm, Carlsbad, CA.

Conditioning: Adult mussels were received on 7-17-09 and placed in trays with flowing seawater. Holding conditions for the five days prior to the test averaged: temperature, $16.8 \pm 1.4^{\circ}$ C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 0.3 %; and dissolved oxygen, 5.6 ± 0.8 mg/L. Photoperiod was natural daylight.

Source of Gametes: 1 female and 1 male.

TEST PROCEDURES AND CONDITIONS

Test Chambers: 30 ml borosilicate glass vials containing 10 ml of test solutions.

Test Concentrations: 0.16, 0.08, 0.04, 0.02, 0.01, and 0% (Control).

Brine Control: None used Replicates/Treatment: 4

<u>Initial Concentration of Test Organisms</u>: 27.2/ml. <u>Volume of Subsamples Taken for Counting</u>: NA

Water Volume Changes per 24 hr: None (non-renewal static test).

Aeration: None Feeding: None

Effects Criteria: The effect criteria used were: 1) ability of embryos to survive and produce completely developed shells; and 2) survival. Data collected were: 1) the initial embryo density; 2) the number of abnormal larvae observed; and 3) the number of normal (live with completely developed shells) larvae observed.

Water Quality and Other Test Conditions: Temperature, $15.6 \pm 0.3^{\circ}$ C; pH, 8.2 ± 0.1 ; salinity, 29.9 ± 0.2 ‰; and dissolved oxygen, 8.1 ± 0.1 mg/L. Photoperiod 16:8 hr, L:D.

DATA ANALYSIS METHODS

The proportion of surviving larvae, and the proportion of normal surviving larvae were calculated for each treatment replicate. The calculation used for the proportion of normal surviving larvae, Combined Proportion Normal, was the combined endpoint specified by EPA/600/R-95/136. The means were obtained for each treatment level and the latter were then corrected for control response using Abbott's formula. The LC50 (survival) and the EC50 (normality) were calculated, where data permitted, using either the Maximum-Likelihood Probit or the Trimmed Spearman-Karber methods. An IC25 was determined by linear interpolation with bootstrapping. NOEC and LOEC values for survival and normality were computed using either Dunnett's test, T-test with Bonferroni's adjustment, Steel's Many-One Rank Test, or Wilcoxon Rank Sum Test with Bonferroni Adjustment. The appropriate test was selected after evaluating the data for normality and homogeneity of variance. An arcsine-square root (angular) transformation was performed on the data prior to statistical analysis. The statistical software employed for these calculations was CETIS, v1.7.0C, Tidepool Scientific Software. Toxic units (TU_c) were computed as 100/NOEC, 100/EC50, or 100/IC25.

PROTOCOL DEVIATIONS

None

REFERENCE TOXICANT TEST

The routine reference toxicant test is a standard multi-concentration toxicity test using copper sulfate to evaluate the performance of the test organisms used in the effluent toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-2595

Reference Toxicant and Source: Copper as CuSO₄•5H₂O, Argent Lot No. 0195. Concentrated stock prepared 8-3-07.

Test Date: 7-22-09

Dilution Water Used: Yaquina Bay, OR seawater. Salinity 30.0 %, pH 8.1.

Results: EC50, 10.9 μ g/L; NOEC, 8 μ g/L; IC25, 9.42 μ g/L. The EC50 results are within the laboratory's control chart warning limits (8.02 – 12.1 μ g/L).

TEST RESULTS

Detailed tabulations of the test results are given in Table 1. The biological effects, given as the NOEC, LOEC, EC50/LC50 for normality and survival, and IC25 for normality are summarized below.

	Combined Proportion Normal	Survival
NOEC (%)	0.16 (TU _c =625)	0.16 (TU _c =625)
LOEC (%)	>0.16 (TU _c <625)	>0.16 (TU _c <625)
EC50/LC50 (%) (95% C.I.)	>0.16 (TU _c <625)	>0.16 (TU _c <625)
Method of Calculation	By Data Inspection	By Data Inspection
IC25 (%) (95% C.I.)	>0.16 (TU _c <625)	
Method of Calculation	Linear Interpolation	

DISCUSSION/CONCLUSIONS

The NOEC was 0.16 % effluent, and the EC50 and IC25 for abnormal development were both >0.16 %.

STUDY APPROVAL

roject	Viana	ger						Date	_
\bigcirc	1	1	1	1	,		,		

Study Director Date

Table 1. Test response of mussel (*Mytilus galloprovincialis*) larvae exposed to XTO Energy – East Foreland.

Test Material					Prop	nbined portion rmal*		ortion vived*
Concentration (%)	Repl.	Norm.	Abn.	Total		Mean		Mean
0.16	1	253	7	260	0.930		0.956	
	2	212	6	218	0.779		0.802	
	3	260	10	270	0.956		0.993	
	4	245	3	248	0.901	0.892	0.912	0.915
0.08	1	234	8	242	0.860		0.890	
	2	248	9	257	0.912		0.945	
	3	242	6	248	0.890		0.912	
	4	221	7	228	0.813	0.869	0.838	0.896
0.04	1	270	6	276	0.993		1.000	
	2	251	3	254	0.923		0.934	
	3	247	6	253	0.908		0.930	
	4	234	5	239	0.860	0.921	0.879	0.936
0.02	1	235	7	242	0.864		0.890	
	2	230	6	236	0.846		0.868	
	3	268	4	272	0.985		1.000	
	4	252	9	261	0.927	0.905	0.960	0.929
0.01	1	274	5	279	0.982		1.000	
	2	263	8	271	0.967		0.996	
	3	249	5	254	0.915		0.934	
	4	238	3	241	0.875	0.935	0.886	0.954
Normal Control	1	231	9	240	0.849		0.882	
	2	252	3	255	0.927		0.938	
	3	225	5	230	0.827		0.846	
	4	247	3	250	0.908	0.878	0.919	0.896

^{*} Based on an average initial count of 272 embryos per 10 ml sample, except that for the case in the combined proportion normal endpoint where number normal>average initial count, number normal is divided by the total count (as per EPA/600/R-95/136).

[†] Result significantly different (P≤0.05) from the control.

TEST IDENTIFICATION

Test No.: 663-63

Title: Mussel (Mytilus galloprovincialis) larval test using static 48-hr exposure to XTO Energy - Platform A non-contact cooling water.

Protocol No.: NAS-XXX-CG/MG2, August 28, 1990, Revision 3 (9-8-01). This protocol complies with the U.S. EPA West Coast chronic toxicity manual (EPA/600/R-95/136) and ASTM bivalve toxicity method (E 724-89).

STUDY MANAGEMENT

Study Sponsor: XTO Energy, 52260 Wik Rd, Kenai, AK 99611

Sponsor's Study Monitor: Mr. Ryan Tunseth

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365.

Test Location: Newport laboratory.

Laboratory's Study Personnel: G.A. Buhler, B.S., Proj. Man.; G.J. Irissarri, B.S., Study Dir.; L.K. Nemeth, B.A., M.B.A., QA Officer; M.S. Redmond, M.S., Aq. Toxicol.; S.J. Gage, B.A., Sr. Tech.

Study Schedule:

Test Beginning: 7-22-09, 1445 hrs. Test Ending: 7-24-09, 1450 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR Part 792).

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

<u>Description</u>: XTO Energy - Platform A - non-contact cooling water. Details are as follows:

NAS Sample No.	2799G
Collection Date	7-21-09
Receipt Date	7-22-09
Temperature (°C)	5.1
pH	8.1
Dissolved oxygen (mg/L)	10.6
Salinity (‰)	26.0

Treatments: Sample was briefly temperature-equilibrated prior to use.

Storage: Used date of receipt.

DILUTION WATER

Source: Yaquina Bay, Oregon. Date of Collection: 7-21-09

Water Quality: Salinity, 30.0 %; pH, 8.1

Pretreatment: Filtered to 0.4 µm, aerated, salinity adjusted with Milli-Q water.

BRINE USED FOR SALINITY CONTROL

Species: Mussel (Mytilus galloprovincialis).

Age: 2.0 hours post-fertilization.

Source: Carlsbad Aquafarm, Carlsbad, CA.

Conditioning: Adult mussels were received on 7-17-09 and placed in trays with flowing seawater. Holding conditions for the five days prior to the test averaged: temperature, 16.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 9.8 ± 1.4 °C; pH, 9.8 ± 0.6 °C; 0.3 %; and dissolved oxygen, 5.6 ± 0.8 mg/L. Photoperiod was natural daylight.

Source of Gametes: I female and I male.

TEST PROCEDURES AND CONDITIONS

Test Chambers: 30 ml borosilicate glass vials containing 10 ml of test solutions.

Test Concentrations: 0.16, 0.08, 0.04, 0.02, 0.01, and 0% (Control).

Brine Control: None used Replicates/Treatment: 4

Initial Concentration of Test Organisms: 27.2/ml. Volume of Subsamples Taken for Counting: NA

Water Volume Changes per 24 hr: None (non-renewal static test).

Aeration: None Feeding: None

Effects Criteria: The effect criteria used were: 1) ability of embryos to survive and produce completely developed shells; and 2) survival. Data collected were: 1) the initial embryo density; 2) the number of abnormal larvae observed; and 3) the number of normal (live with completely developed shells) larvae

Water Quality and Other Test Conditions: Temperature, 15.5 ± 0.4°C; pH, 8.1 ± 0.0; salinity, 29.9 ± 0.2 ‰; and dissolved oxygen, 8.1 ± 0.1 mg/L. Photoperiod 16:8 hr, L:D.

DATA ANALYSIS METHODS

The proportion of surviving larvae, and the proportion of normal surviving larvae were calculated for each treatment replicate. The calculation used for the proportion of normal surviving larvae, Combined Proportion Normal, was the combined endpoint specified by EPA/600/R-95/136. The means were obtained for each treatment level and the latter were then corrected for control response using Abbott's formula. The LC50 (survival) and the EC50 (normality) were calculated, where data permitted, using either the Maximum-Likelihood Probit or the Trimmed Spearman-Karber methods. An IC25 was determined by linear interpolation with bootstrapping. NOEC and LOEC values for survival and normality were computed using either Dunnett's test, T-test with Bonferroni's adjustment, Steel's Many-One Rank Test, or Wilcoxon Rank Sum Test with Bonferroni Adjustment. The appropriate test was selected after evaluating the data for normality and homogeneity of variance. An arcsine-square root (angular) transformation was performed on the data prior to statistical analysis. The statistical software employed for these calculations was CETIS, v1.7.0C, Tidepool Scientific Software. Toxic units (TUe) were computed as 100/NOEC, 100/EC50, or 100/IC25.

PROTOCOL DEVIATIONS

None

REFERENCE TOXICANT TEST

The routine reference toxicant test is a standard multi-concentration toxicity test using copper sulfate to evaluate the performance of the test organisms used in the effluent toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-2595

Reference Toxicant and Source: Copper as CuSO₄•5H₂O, Argent Lot No. 0195. Concentrated stock prepared 8-3-07.

Test Date: 7-22-09

Dilution Water Used: Yaquina Bay, OR seawater. Salinity 30.0 ‰, pH 8.1.

Results: EC50, 10.9 μ g/L; NOEC, 8 μ g/L; 1C25, 9.42 μ g/L. The EC50 results are within the laboratory's control chart warning limits (8.02 - 12.1 μ g/L).

TEST RESULTS

Detailed tabulations of the test results are given in Table 1. The biological effects, given as the NOEC, LOEC, EC50/LC50 for normality and survival, and IC25 for normality are summarized below.

None was	Combined Proportion Normal	Survival
NOEC (%) LOEC (%) EC50/LC50 (%) (95% C.I.) Method of Calculation	0.16 (TU _c =625) >0.16 (TU _c <625) >0.16 (TU _c <625) — By Data Inspection	0.16 (TU _c =625) >0.16 (TU _c <625) >0.16 (TU _c <625) — By Data Inspection
IC25 (%) (95% C.I.) Method of Calculation	>0.16 (TU _c <625) Linear Interpolation	

DISCUSSION/CONCLUSIONS

The NOEC was 0.16 % effluent, and the EC50 and IC25 for abnormal development were both >0.16 %.

STUDY APPROVAL

Project Manager Date Study Director Date

Project Manager Study Director Date

Project Manager Study Director Date

Project Manager Date

Study Director Date

Study Director Date

Project Manager Study Director Date

Project Manager Date

Study Director Date

Table 1. Test response of mussel (Mytilus galloprovincialis) larvae exposed to XTO Energy - Platform A - non-contact cooling water.

					Cor	nbined		
Test Material						Proportion		ortion
						rmal*	Survived*	
Concentration (%)	Repl.	Norm.	Abn.	Total		Mean	***************************************	Mean
0.16	1	260	4	264	0.956		0.971	ivican
	2	238	2	240	0.875		0.882	
	3	241	7	248	0.886		0.882	
	4	270	7	277	0.993	0.927	1.000	0.941
						0.727	1.000	0.341
0.08	1	250	5	255	0.919		0.938	
	2	261	9	270	0.960		0.993	
	3	240	5	245	0.882		0.901	
	4	274	6	280	0.979	0.935	1.000	0.958
						0.,,,,	2.000	0.730
0.04	1	260	5	265	0.956		0.974	
	2	241	2	243	0.886		0.893	
	3	257	4	261	0.945		0.960	
	4	266	11	277	0.978	0.941	1.000	0.957
								0.757
0.02	1	248	9	257	0.912		0.945	
	2	229	2	231	0.842		0.849	
	3	224	6	230	0.824		0.846	
	4	244	6	250	0.897	0.869	0.919	0.890
						•		31070
0.01	1	265	7	272	0.974		1.000	
	2	242	6	248	0.890		0.912	
	3	253	8	261	0.930		0.960	
	4	228	6	234	0.838	0.908	0.860	0.933
							•	- 72 20 20
Normal Control	1	269	5	274	0.989		1.000	
	2	270	3	273	0.993		1.000	
	3	256	6	262	0.941		0.963	
	4	246	4	250	0.904	0.957	0.919	0.971

^{*} Based on an average initial count of 272 embryos per 10 ml sample, except that for the case in the combined proportion normal endpoint where number normal>average initial count, number normal is divided by the total count (as per EPA/600/R-95/136).

[†] Result significantly different (P≤0.05) from the control.

TEST IDENTIFICATION

Test No.: 663-62

Title: Mussel (Mytilus galloprovincialis) larval test using static 48-hr exposure to XTO Energy - Platform A water flood.

Protocol No.: NAS-XXX-CG/MG2, August 28, 1990, Revision 3 (9-8-01). This protocol complies with the U.S. EPA West Coast chronic toxicity manual (EPA/600/R-95/136) and ASTM bivalve toxicity method (E 724-89).

STUDY MANAGEMENT

Study Sponsor: XTO Energy, 52260 Wik Rd, Kenai, AK 99611

Sponsor's Study Monitor: Mr. Ryan Tunseth

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365.

Test Location: Newport laboratory.

Laboratory's Study Personnel: G.A. Buhler, B.S., Proj. Man.; G.J. Irissarri, B.S., Study Dir.; L.K. Nemeth, B.A., M.B.A., QA Officer; M.S. Redmond, M.S., Aq. Toxicol.; S.J. Gage, B.A., Sr. Tech.

Study Schedule:

Test Beginning: 7-22-09, 1445 hrs. Test Ending: 7-24-09, 1450 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Description: XTO Energy - Platform A - water flood. Details are as follows:

NAS Sample No.	2798G
Collection Date	7-21-09
Receipt Date	7-22-09
Temperature (°C)	4.7
pH	8.1
Dissolved oxygen (mg/L)	10.4
Salinity (‰)	26.0

Treatments: Sample was briefly temperature-equilibrated prior to use.

Storage: Used date of receipt.

DILUTION WATER

Source: Yaquina Bay, Oregon. Date of Collection: 7-21-09

Water Quality: Salinity, 30.0 %; pH, 8.1

Pretreatment: Filtered to 0.4 µm, aerated, salinity adjusted with Milli-Q water.

BRINE USED FOR SALINITY CONTROL

Species: Mussel (Mytilus galloprovincialis).

Age: 2.0 hours post-fertilization.

Source: Carlsbad Aquafarm, Carlsbad, CA.

Conditioning: Adult mussels were received on 7-17-09 and placed in trays with flowing seawater. Holding conditions for the five days prior to the test averaged: temperature, 16.8 ± 1.4°C; pH, 7.3 ± 0.6; salinity, 33.8 ± 0.3 %; and dissolved oxygen, 5.6 \pm 0.8 mg/L. Photoperiod was natural daylight.

Source of Gametes: 1 female and 1 male.

TEST PROCEDURES AND CONDITIONS

Test Chambers: 30 ml borosilicate glass vials containing 10 ml of test solutions.

Test Concentrations: 0.16, 0.08, 0.04, 0.02, 0.01, and 0% (Control).

Brine Control: None used Replicates/Treatment: 4

Initial Concentration of Test Organisms: 27.2/ml. Volume of Subsamples Taken for Counting: NA

Water Volume Changes per 24 hr: None (non-renewal static test).

Aeration: None Feeding: None

Effects Criteria: The effect criteria used were: 1) ability of embryos to survive and produce completely developed shells; and 2) survival. Data collected were: 1) the initial embryo density; 2) the number of abnormal larvae observed; and 3) the number of normal (live with completely developed shells) larvae

Water Quality and Other Test Conditions: Temperature, 15.6 ± 0.3 °C; pH, 8.2 ± 0.1; salinity, 29.8 ± 0.2 %; and dissolved oxygen, 8.1 ± 0.1 mg/L. Photoperiod 16:8 hr, L:D.

DATA ANALYSIS METHODS

The proportion of surviving larvae, and the proportion of normal surviving larvae were calculated for each treatment replicate. The calculation used for the proportion of normal surviving larvae, Combined Proportion Normal, was the combined endpoint specified by EPA/600/R-95/136. The means were obtained for each treatment level and the latter were then corrected for control response using Abbott's formula. The LC50 (survival) and the EC50 (normality) were calculated, where data permitted, using either the Maximum-Likelihood Probit or the Trimmed Spearman-Karber methods. An IC25 was determined by linear interpolation with bootstrapping. NOEC and LOEC values for survival and normality were computed using either Dunnett's test, T-test with Bonferroni's adjustment, Steel's Many-One Rank Test, or Wilcoxon Rank Sum Test with Bonferroni Adjustment. The appropriate test was selected after evaluating the data for normality and homogeneity of variance. An arcsine-square root (angular) transformation was performed on the data prior to statistical analysis. The statistical software employed for these calculations was CETIS, v1.7.0C, Tidepool Scientific Software. Toxic units (TUe) were computed as 100/NOEC, 100/EC50, or 100/IC25.

PROTOCOL DEVIATIONS

None

REFERENCE TOXICANT TEST

The routine reference toxicant test is a standard multi-concentration toxicity test using copper sulfate to evaluate the performance of the test organisms used in the effluent toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-2595

Reference Toxicant and Source: Copper as CuSO₄•5H₂O, Argent Lot No. 0195. Concentrated stock prepared 8-3-07.

Test Date: 7-22-09

Dilution Water Used: Yaquina Bay, OR seawater. Salinity 30.0 ‰, pH 8.1.

Results: EC50, 10.9 μ g/L; NOEC, 8 μ g/L; lC25, 9.42 μ g/L. The EC50 results are within the laboratory's control chart warning limits (8.02 - 12.1 µg/L).

TEST RESULTS

Detailed tabulations of the test results are given in Table 1. The biological effects, given as the NOEC, LOEC, EC50/LC50 for normality and survival, and IC25 for normality are summarized below.

	Combined Proportion Normal	Survival
NOEC (%)	0.16 (TU _c =625)	0.16 (TU _s =625)
LOEC (%)	>0.16 (TU _c <625)	>0.16 (TU _s <625)
EC50/LC50 (%) (95% C.I.)	>0.16 (TU _c <625)	>0.16 (TU _e <625)
Method of Calculation	By Data Inspection	By Data Inspection
IC25 (%)	>0.16 (TU _c <625)	
(95% C.I.) Method of Calculation	Linear Interpolation	

DISCUSSION/CONCLUSIONS

The NOEC was 0.16 % effluent, and the EC50 and IC25 for abnormal development were both >0.16 %.

STUDY APPROVAL

2	111	_
- Our	Donne	8-2109
Project Manag	рет	Date

Laboratory Director Date

Table 1. Test response of mussel (Mytilus galloprovincialis) larvae exposed to XTO Energy – Platform A – water flood.

Test Material					Prop	nbined portion rmal*		portion vived*
Concentration (%)	Repl.	Norm.	Abn.	Total		Mean		Mean
0.16	1	244	2	246	0.897		0.904	
	2 3	231	3	234	0.849		0.860	
		245	4	249	0.901		0.915	
	4	271	10	281	0.996	0.911	1.000	0.920
0.08	1	258	9	267	0.949		0.982	
	2	243	7	250	0.893		0.919	
	3	210	6	216	0.772		0.794	
	4	242	7	249	0.890	0.876	0.915	0.903
0.04	1	262	4	266	0.963		0.978	
	2	267	4	271	0.982		0.996	
	3	246	11	257	0.904		0.945	
	4	247	6	253	0.908	0.939	0.930	0.962
0.02	1	263	6	269	0.967		0.989	
	2	270	7	277	0993		1.000	
	3	287	8	295	0.973		1.000	
	4	268	6	274	0.985	0.979	1.000	0.997
0.01	I	286	5	291	0.983		1.000	
	2	268	10	278	0.985		1.000	
	3	231	4	235	0.849		0.864	
	4	238	9	247	0.875	0.923	0.908	0.943
Normal Control	1	260	5	265	0.956		0.974	
	2	278	8	286	0.972		1.000	
	3	254	11	265	0.934		0.974	
	4	229	5	234	0.842	0.926	0.860	0.952

^{*} Based on an average initial count of 272 embryos per 10 ml sample, except that for the case in the combined proportion normal endpoint where number normal>average initial count, number normal is divided by the total count (as per EPA/600/R-95/136).

[†] Result significantly different (P≤0.05) from the control.

TEST IDENTIFICATION

Test No.: 663-65

Title: Mussel (Mytilus galloprovincialis) larval test using static 48-hr exposure to XTO Energy - Platform C non-contact cooling water.

Protocol No.: NAS-XXX-CG/MG2, August 28, 1990, Revision 3 (9-8-01). This protocol complies with the U.S. EPA West Coast chronic toxicity manual (EPA/600/R-95/136) and ASTM bivalve toxicity method (E 724-89).

STUDY MANAGEMENT

Study Sponsor: XTO Energy, 52260 Wik Rd, Kenai, AK 99611

Sponsor's Study Monitor: Mr. Ryan Tunseth

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365.

Test Location: Newport laboratory.

Laboratory's Study Personnel: G.A. Buhler, B.S., Proj. Man.; G.J. Irissarri, B.S., Study Dir.; L.K. Nemeth,

B.A., M.B.A., QA Officer; M.S. Redmond, M.S., Aq. Toxicol.; S.J. Gage, B.A., Sr. Tech.

Study Schedule:

Test Beginning: 7-22-09, 1445 hrs. Test Ending: 7-24-09, 1450 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR 97365.

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Description: XTO Energy - Platform C - non-contact cooling water. Details are as follows:

NAS Sample No.	2801G
Collection Date	7-21-09
Receipt Date	7-22-09
Temperature (°C)	5.1
pH	7.9
Dissolved oxygen (mg/L)	10.5
Salinity (%)	27.0

Treatments: Sample was briefly temperature-equilibrated prior to use.

Storage: Used date of receipt.

DILUTION WATER

Source: Yaquina Bay, Oregon. Date of Collection: 7-21-09

Water Quality: Salinity, 30.0 %; pH, 8.1

<u>Pretreatment</u>: Filtered to 0.4 μm , aerated, salinity adjusted with Milli-Q water.

BRINE USED FOR SALINITY CONTROL

Species: Mussel (Mytilus galloprovincialis).

Age: 2.0 hours post-fertilization.

Source: Carlsbad Aquafarm, Carlsbad, CA.

Conditioning: Adult mussels were received on 7-17-09 and placed in trays with flowing seawater. Holding conditions for the five days prior to the test averaged: temperature, 16.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 0.6 °C; pH, 7.3 ± 0.6 °C; pH, 7.30.3 %; and dissolved oxygen, 5.6 ± 0.8 mg/L. Photoperiod was natural daylight.

Source of Gametes: 1 female and 1 male.

TEST PROCEDURES AND CONDITIONS

Test Chambers: 30 ml borosilicate glass vials containing 10 ml of test solutions.

Test Concentrations: 0.16, 0.08, 0.04, 0.02, 0.01, and 0% (Control).

Brine Control: None used Replicates/Treatment: 4

Initial Concentration of Test Organisms: 27.2/ml. Volume of Subsamples Taken for Counting: NA

Water Volume Changes per 24 hr: None (non-renewal static test).

Acration: None Feeding: None

Effects Criteria: The effect criteria used were: 1) ability of embryos to survive and produce completely developed shells; and 2) survival. Data collected were: 1) the initial embryo density; 2) the number of abnormal larvae observed; and 3) the number of normal (live with completely developed shells) larvae

Water Quality and Other Test Conditions: Temperature, 15.7 ± 0.3 °C; pH, 8.1 ± 0.0 ; salinity, 30.0 ± 0.3 %; and dissolved oxygen, 8.1 ± 0.0 mg/L. Photoperiod 16:8 hr, L:D.

DATA ANALYSIS METHODS

The proportion of surviving larvae, and the proportion of normal surviving larvae were calculated for each treatment replicate. The calculation used for the proportion of normal surviving larvae, Combined Proportion Normal, was the combined endpoint specified by EPA/600/R-95/136. The means were obtained for each treatment level and the latter were then corrected for control response using Abbott's formula. The LC50 (survival) and the EC50 (normality) were calculated, where data permitted, using either the Maximum-Likelihood Probit or the Trimmed Spearman-Karber methods. An IC25 was determined by linear interpolation with bootstrapping. NOEC and LOEC values for survival and normality were computed using either Dunnett's test, T-test with Bonferroni's adjustment, Steel's Many-One Rank Test, or Wilcoxon Rank Sum Test with Bonferroni Adjustment. The appropriate test was selected after evaluating the data for normality and homogeneity of variance. An arcsine-square root (angular) transformation was performed on the data prior to statistical analysis. The statistical software employed for these calculations was CETIS, v1.7.0C, Tidepool Scientific Software. Toxic units (TUc) were computed as 100/NOEC, 100/EC50, or 100/IC25.

PROTOCOL DEVIATIONS

None

REFERENCE TOXICANT TEST

The routine reference toxicant test is a standard multi-concentration toxicity test using copper sulfate to evaluate the performance of the test organisms used in the effluent toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-2595

Reference Toxicant and Source: Copper as CuSO₄•5H₂O, Argent Lot No. 0195. Concentrated stock prepared

Test Date: 7-22-09

Dilution Water Used: Yaquina Bay, OR seawater. Salinity 30.0 ‰, pH 8.1.

Results: EC50, 10.9 μ g/L; NOEC, 8 μ g/L; lC25, 9.42 μ g/L. The EC50 results are within the laboratory's control chart warning limits (8.02 - 12.1 µg/L).

TEST RESULTS

Detailed tabulations of the test results are given in Table 1. The biological effects, given as the NOEC, LOEC, EC50/LC50 for normality and survival, and IC25 for normality are summarized below.

318.8 2 (2.2)	Combined Proportion Normal	Survival		
NOEC (%)	0.16 (TU _c =625)	0.16 (TU _e =625)		
LOEC (%) EC50/LC50 (%)	>0.16 (TU _e <625)	>0.16 (TU _c <625)		
(95% C.I.)	>0.16 (TU _c <625)	>0.16 (TU _e <625)		
Method of Calculation	By Data Inspection	By Data Inspection		
IC25 (%)	>0.16 (TU _c <625)			
(95% C.I.) Method of Calculation	Linear Interpolation			

DISCUSSION/CONCLUSIONS

The NOEC was 0.16 % effluent, and the EC50 and IC25 for abnormal development were both >0.16 %.

STUDY APPROVAL

Project Manager		Date
Pull	1. Pellus	Fluilog

Con Bull 7-2109

Toject Manager

Date

Study Director

Date

Och of A. Coldum 8/2/09

Date

Ouglity Assurance Unit

Date

Table 1. Test response of mussel (*Mytilus galloprovincialis*) larvae exposed to XTO Energy – Platform C – non-contact cooling water.

Test Material					Pro	Combined Proportion Normal* Mean		Proportion Survived*	
Concentration (%)	Repl.	Norm.	Abn.	Total				Mean	
0.16	1	237	8	245	0.871		0.901	1410011	
	2	228	7	235	0.838		0.864		
	3	285	11	296	0.963		1.000		
	4	259	3	262	0.952	0.906	0.963	0.932	
0.08	1	246	7	253	0.904		0.930		
	2	258	6	264	0.949		0.930		
	3	244	5	249	0.897		0.915		
	4	263	6	269	0.967	0.929	0.989	0.951	
0.04	1	260	8	268	0.956		0.985		
	2	220	12	232	0.809		0.853		
	3	240	7	247	0.882		0.908		
	4	226	8	234	0.831	0.870	0.860	0.902	
0.02	1	268	8	276	0.985		1.000		
	2	263	3	266	0.967		0.978		
	3	260	10	270	0.956		0.993		
	4	249	8	257	0.915	0.956	0.945	0.979	
0.01	1	261	11	272	0.960		1.000		
	2	268	4	272	0.985		1.000		
	3	228	6	234	0.838		0.860		
	4	252	9	261	0.927	0.927	0.960	0.955	
Normal Control	l	264	2	266	0.971		0.978		
	2	224	5	229	0.824		0.842		
	3	259	5	264	0.952		0.971		
	4	249	7	256	0.915	0.915	0.941	0.933	

^{*} Based on an average initial count of 272 embryos per 10 ml sample, except that for the case in the combined proportion normal endpoint where number normal>average initial count, number normal is divided by the total count (as per EPA/600/R-95/136).

[†] Result significantly different (P≤0.05) from the control.

TEST IDENTIFICATION

Test No.: 663-64

Title: Mussel (Mytilus galloprovincialis) larval test using static 48-hr exposure to XTO Energy - Platform C -

Protocol No.: NAS-XXX-CG/MG2, August 28, 1990, Revision 3 (9-8-01). This protocol complies with the U.S. EPA West Coast chronic toxicity manual (EPA/600/R-95/136) and ASTM bivalve toxicity method (E 724-89).

STUDY MANAGEMENT

Study Sponsor: XTO Energy, 52260 Wik Rd, Kenai, AK 99611

Sponsor's Study Monitor: Mr. Ryan Tunseth

Testing Laboratory: Northwestern Aquatic Sciences, P.O. Box 1437, Newport, OR 97365.

Test Location: Newport laboratory.

Laboratory's Study Personnel: G.A. Buhler, B.S., Proj. Man.; G.J. Irissarri, B.S., Study Dir.; L.K. Nemeth,

B.A., M.B.A., QA Officer; M.S. Redmond, M.S., Aq. Toxicol.; S.J. Gage, B.A., Sr. Tech.

Study Schedule:

Test Beginning: 7-22-09, 1445 hrs.

Test Ending: 7-24-09, 1450 hrs.

Disposition of Study Records: All specimens, raw data, reports and other study records are stored according to Good Laboratory Practice regulations at Northwestern Aquatic Sciences, 3814 Yaquina Bay Rd., Newport, OR

Good Laboratory Practices: The test was conducted following the principles of Good Laboratory Practices (GLP) as defined in the EPA/TSCA Good Laboratory Practice regulations revised August 17, 1989 (40 CFR

Statement of Quality Assurance: The test data were reviewed by the Quality Assurance Unit to assure that the study was performed in accordance with the protocol and standard operating procedures. This report is an accurate reflection of the raw data.

TEST MATERIAL

Description: XTO Energy Platform C - water flood. Details are as follows:

NAS Sample No.	2800G
Collection Date	7-21-09
Receipt Date	7-22-09
Temperature (°C)	5.2
pH	8.0
Dissolved oxygen (mg/L)	10.5
Salinity (%)	27.0

Treatments: Sample was briefly temperature-equilibrated prior to use.

Storage: Used date of receipt.

DILUTION WATER

Source: Yaquina Bay, Oregon. Date of Collection: 7-21-09

Water Quality: Salinity, 30.0 %; pH, 8.1

Pretreatment: Filtered to 0.4 µm, aerated, salinity adjusted with Milli-Q water.

BRINE USED FOR SALINITY CONTROL

Species: Mussel (Mytilus galloprovincialis).

Age: 2.0 hours post-fertilization.

Source: Carlsbad Aquafarm, Carlsbad, CA.

Conditioning: Adult mussels were received on 7-17-09 and placed in trays with flowing seawater. Holding conditions for the five days prior to the test averaged: temperature, 16.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 1.4 °C; pH, 7.3 ± 0.6 ; salinity, 33.8 ± 0.6 °C; pH, 7.3 ± 0.6 °C; pH,

0.3 %, and dissolved oxygen, 5.6 ± 0.8 mg/L. Photoperiod was natural daylight.

Source of Gametes: 1 female and 1 male.

TEST PROCEDURES AND CONDITIONS

Test Chambers: 30 ml borosilicate glass vials containing 10 ml of test solutions.

Test Concentrations: 0.16, 0.08, 0.04, 0.02, 0.01, and 0% (Control).

Brine Control: None used Replicates/Treatment: 4

Initial Concentration of Test Organisms: 27.2/ml. Volume of Subsamples Taken for Counting: NA

Water Volume Changes per 24 hr: None (non-renewal static test).

Aeration: None Feeding: None

Effects Criteria: The effect criteria used were: 1) ability of embryos to survive and produce completely developed shells; and 2) survival. Data collected were: 1) the initial embryo density; 2) the number of abnormal larvae observed; and 3) the number of normal (live with completely developed shells) larvae

Water Quality and Other Test Conditions: Temperature, 15.6 ± 0.3 °C; pH, 8.1 ± 0.0; salinity, 29.8 ± 0.2 ‰; and dissolved oxygen, 8.1 ± 0.1 mg/L. Photoperiod 16:8 hr, L:D.

DATA ANALYSIS METHODS

The proportion of surviving larvae, and the proportion of normal surviving larvae were calculated for each treatment replicate. The calculation used for the proportion of normal surviving larvae, Combined Proportion Normal, was the combined endpoint specified by EPA/600/R-95/136. The means were obtained for each treatment level and the latter were then corrected for control response using Abbott's formula. The LC50 (survival) and the EC50 (normality) were calculated, where data permitted, using either the Maximum-Likelihood Probit or the Trimmed Spearman-Karber methods. An IC25 was determined by linear interpolation with bootstrapping. NOEC and LOEC values for survival and normality were computed using either Dunnett's test, T-test with Bonferroni's adjustment, Steel's Many-One Rank Test, or Wilcoxon Rank Sum Test with Bonferroni Adjustment. The appropriate test was selected after evaluating the data for normality and homogeneity of variance. An arcsine-square root (angular) transformation was performed on the data prior to statistical analysis. The statistical software employed for these calculations was CETIS, v1.7.0C, Tidepool Scientific Software. Toxic units (TU_c) were computed as 100/NOEC, 100/EC50, or 100/IC25.

PROTOCOL DEVIATIONS

None

REFERENCE TOXICANT TEST

The routine reference toxicant test is a standard multi-concentration toxicity test using copper sulfate to evaluate the performance of the test organisms used in the effluent toxicity test. The performance is evaluated by comparing the results of this test with historical results obtained at the laboratory. A summary of the reference toxicant test result is given below. The reference toxicant test raw data are found in Appendix III.

Test No.: 999-2595

Reference Toxicant and Source: Copper as CuSO₄•5H₂O, Argent Lot No. 0195. Concentrated stock prepared 8-3-07.

Test Date: 7-22-09

Dilution Water Used: Yaquina Bay, OR seawater. Salinity 30.0 %, pH 8.1.

Results: EC50, 10.9 μ g/L; NOEC, 8 μ g/L; IC25, 9.42 μ g/L. The EC50 results are within the laboratory's control chart warning limits (8.02 – 12.1 μ g/L).

TEST RESULTS

Detailed tabulations of the test results are given in Table 1. The biological effects, given as the NOEC, LOEC, EC50/LC50 for normality and survival, and IC25 for normality are summarized below.

NOFC (BC)	Combined Proportion Normal	Survival		
NOEC (%) LOEC (%) EC50/LC50 (%) (95% C.I.) Method of Calculation	0.16 (TU _c =625) >0.16 (TU _c <625) >0.16 (TU _c <625) ————————————————————————————————————	0.16 (TU _e =625) >0.16 (TU _e <625) >0.16 (TU _e <625) By Data Inspection		
IC25 (%) (95% C.I.) Method of Calculation	>0.16 (TU _c <625) Linear Interpolation			

DISCUSSION/CONCLUSIONS

The NOEC was 0.16 % effluent, and the EC50 and IC25 for abnormal development were both >0.16 %.

STUDY APPROVAL

_ Buy But	Le Portog
Project Manager	Date

Richard Soldword F/21/07
Laboratory Director Date

Study Director Date

Quality Assurance Unit

Data

Table 1. Test response of mussel (*Mytilus galloprovincialis*) larvae exposed to XTO Energy Platform C – water flood.

				Combined Proportion Normal*			portion vived*
Repl.			Total		Mean		Mean
1	283	9	292	0.969		1.000	trican
	245	7	252	0.901			
	267	4	271	0.982			
4	251	3	254	0.923	0.944	0.934	0.964
1	263	12	275	0.967		1.000	
	237	8	245				
	245	4	249				
4	245	4	249	0.901	0.910	0.915	0.933
1	250	9	259	0.919		0.052	
2	242						
3	265	7					
4	247	4	251	0.908	0.923	0.923	0.949
1	246	8	254	0.904		0.024	
2	285						
3	237						
4	274	8	282	0.972	0.929	1.000	0.960
1	276	4	280	0.986		1.000	
2	262						
3	232						
4	247	6	253	0.908	0.928	0.864	0.942
1	223	7	230	0.830			
4		-			0.011		0.936
	2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 4 1 2 3 4 4 1 2 3 4 4 1 2 3 4 4 1 4 3 4 4 1 2 3 4 4 4 3 4 4 3 4 4 4 3 4 3 4 4 3 4 4 3 4 4 3 4 4 3 4 4 3 4 4 3 4 3 4 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 3 4 3 4 3 4 3 4 3 4 3 4 3 3 4 3 3 4 3 4 3 4 3 4 3 3 3 4 3 4 3 4 3 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 3 4 4 3 3 3 4 3 4 3 4 3 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 3 4 3 4 3 4 3 3 4 3 4 3 4 3 3 4 3 4 3 3 4 3 3 4 3 3 4 3 4 3 3 4 3 3 4 3 4 3 3 4 3 4 3 3 3 4 3 4 3 3 3 3 4 3 4 3 3 3 3 4 3 3 3 3 4 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	1 283 2 245 3 267 4 251 1 263 2 237 3 245 4 245 1 250 2 242 3 265 4 247 1 246 2 285 3 237 4 274 1 276 2 262 3 232 4 247 1 223 2 68 3 242 4 258	1 283 9 2 245 7 3 267 4 4 251 3 1 263 12 2 237 8 3 245 4 4 245 4 1 250 9 2 242 9 3 265 7 4 247 4 1 246 8 2 285 9 3 237 9 4 274 8 1 276 4 2 262 3 3 232 3 4 247 6 1 223 7 2 268 6 3 242 6 4 258 10	1 283 9 292 2 245 7 252 3 267 4 271 4 251 3 254 1 263 12 275 2 237 8 245 3 245 4 249 4 245 4 249 1 250 9 259 2 242 9 251 3 265 7 272 4 247 4 251 1 246 8 254 2 285 9 294 3 237 9 246 4 274 8 282 1 276 4 280 2 262 3 265 3 232 3 235 4 247 6 253 1 223 7 230 2 268 6 274 3	1 283 9 292 0.969 2 245 7 252 0.901 3 267 4 271 0.982 4 251 3 254 0.923 1 263 12 275 0.967 2 237 8 245 0.871 3 245 4 249 0.901 4 245 4 249 0.901 1 250 9 259 0.919 2 242 9 251 0.890 3 265 7 272 0.974 4 247 4 251 0.908 1 246 8 254 0.904 2 285 9 294 0.969 3 237 9 246 0.871 4 274 8 282 0.972 1 276 4 280 0.986 2 262 3 265 0.963 <t< td=""><td>1 283 9 292 0.969 2 245 7 252 0.901 3 267 4 271 0.982 4 251 3 254 0.923 0.944 1 263 12 275 0.967 2 237 8 245 0.871 3 245 4 249 0.901 4 245 4 249 0.901 0.910 1 250 9 259 0.919 0.910 2 242 9 251 0.890 0.910 3 265 7 272 0.974 0.923 4 247 4 251 0.908 0.923 1 246 8 254 0.904 0.923 1 246 8 254 0.904 0.923 1 246 8 254 0.904 0.923 1 276 4 280 0.986 0.972 0.929</td><td>1 283 9 292 0.969 1.000 2 245 7 252 0.901 0.927 3 267 4 271 0.982 0.996 4 251 3 254 0.923 0.944 0.934 1 263 12 275 0.967 1.000 2 237 8 245 0.871 0.901 3 245 4 249 0.901 0.915 4 245 4 249 0.901 0.910 0.915 1 250 9 259 0.919 0.952 0.923 2 242 9 251 0.890 0.923 0.923 3 265 7 272 0.974 1.000 0.923 4 247 4 251 0.908 0.923 0.923 1 246 8 254 0.904 0.934 0.904 2 285 9 294 0.969 1.000 3</td></t<>	1 283 9 292 0.969 2 245 7 252 0.901 3 267 4 271 0.982 4 251 3 254 0.923 0.944 1 263 12 275 0.967 2 237 8 245 0.871 3 245 4 249 0.901 4 245 4 249 0.901 0.910 1 250 9 259 0.919 0.910 2 242 9 251 0.890 0.910 3 265 7 272 0.974 0.923 4 247 4 251 0.908 0.923 1 246 8 254 0.904 0.923 1 246 8 254 0.904 0.923 1 246 8 254 0.904 0.923 1 276 4 280 0.986 0.972 0.929	1 283 9 292 0.969 1.000 2 245 7 252 0.901 0.927 3 267 4 271 0.982 0.996 4 251 3 254 0.923 0.944 0.934 1 263 12 275 0.967 1.000 2 237 8 245 0.871 0.901 3 245 4 249 0.901 0.915 4 245 4 249 0.901 0.910 0.915 1 250 9 259 0.919 0.952 0.923 2 242 9 251 0.890 0.923 0.923 3 265 7 272 0.974 1.000 0.923 4 247 4 251 0.908 0.923 0.923 1 246 8 254 0.904 0.934 0.904 2 285 9 294 0.969 1.000 3

^{*} Based on an average initial count of 272 embryos per 10 ml sample, except that for the case in the combined proportion normal endpoint where number normal>average initial count, number normal is divided by the total count (as per EPA/600/R-95/136).

[†] Result significantly different (P \leq 0.05) from the control.